Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com

Revue d'Épidémiologie et de Santé Publique 60 (2012) 189–196

Revue d'Épidémiologie et de Santé Publique
Epidemiology and Public Health

Original article

Six-month outcome of elderly people hospitalized via the emergency department: The SAFES cohort

Devenir à six mois de personnes âgées hospitalisées en urgence : la cohorte SAFES

M. Dramé [a,*,b], P.O. Lang [a,c], J.-L. Novella [a,b], D. Narbey [a], R. Mahmoudi [a,b], I. Lanièce [d], D. Somme [e], J.-B. Gauvain [f], D. Heitz [g], T. Voisin [h], B. de Wazières [i], R. Gonthier [j], J. Ankri [k], O. Saint-Jean [e], C. Jeandel [l], P. Couturier [d], F. Blanchard [a,b], D. Jolly [a,m]

[a] *Université de Reims Champagne-Ardenne, faculté de médecine, EA 3797, 51, rue Cognacq-Jay, 51095 Reims cedex, France*
[b] *Département de médecine interne et de gérontologie clinique, hôpital Maison-Blanche, CHU de Reims, 48, rue Cognacq-Jay, 51092 Reims cedex, France*
[c] *Département de réhabilitation et gériatrie, hôpital des Trois-Chêne, hôpitaux universitaires de Genève, chemin du Pont-Bochet 3, CH 1223 Thônex, Switzerland*
[d] *Département de gériatrie, hôpital La Tronche, CHU de Grenoble, boulevard Chantourne, 38700 Grenoble, France*
[e] *Département de gériatrie, hôpital Européen Georges-Pompidou, Assistance publique–Hôpitaux de Paris, 20, rue Leblanc, 75905 Paris cedex 15, France*
[f] *Centre de gériatrie, hôpital de la Porte-Madeleine, CHR d'Orléans, 1, rue Porte-Madeleine, 45032 Orléans cedex, France*
[g] *Département de médecine interne et gériatrie, hôpital de la Robertsau, CHRU de Strasbourg, 21, rue David-Richard, 67015 Strasbourg cedex, France*
[h] *Département de médecine interne et de gérontologie clinique, hôpital Rangueil, CHU de Toulouse, 1, avenue du Professeur-Jean-Poulhès, 31400 Toulouse, France*
[i] *Département de médecine interne et gériatrie, hôpital Gaston-Doumergues, CHU de Nîmes, boulevard du Maréchal-Foch, 30029 Nîmes cedex, France*
[j] *Département gérontologie clinique, hôpital de La Charité, CHU de Saint-Étienne, 44, rue Pointe-Cadet, 42055 Saint-Étienne cedex, France*
[k] *Centre de gérontologie, hôpital Sainte-Périne, Assistance publique–Hôpitaux de Paris, 11, rue Chardon-Lagache, 75016 Paris cedex 16, France*
[l] *Centre de gérontologie clinique, hôpital de La Colombière, CHU de Montpellier, 39, avenue Charles-Flahaut, 34295 Montpellier cedex, France*
[m] *Pôle recherche et innovations unit, hôpital Robert-Debré, CHU de Reims, boulevard du Général-Koenig, 51092 Reims cedex, France*

Received 2 February 2011; accepted 22 November 2011

Abstract

Background. – The objective of the study was to identify factors predictive of 6-month institutionalization or mortality in frail elderly patients after acute hospitalization.

Methods. – A prospective cohort of elderly subjects 75 years and older was set up in nine French teaching hospitals. Data obtained from a comprehensive geriatric assessment were used in a Cox model to predict 6-month institutionalization or mortality. Institutionalization was defined as incident admission either to a nursing home or other long-term care facility during the follow-up period.

Results. – Crude institutionalization and death rates after 6 months of follow-up were 18% and 24%, respectively. Independent predictors of institutionalization were: living alone (HR = 1.83; 95% CI = 1.27–2.62) or a higher number of children (HR = 0.86; 95% CI = 0.78–0.96), balance problems (HR = 1.72; 95% CI = 1.19–2.47), malnutrition or risk thereof (HR = 1.93; 95% CI = 1.24–3.01), and dementia syndrome (HR = 1.88; 95% CI = 1.32–2.67). Factors found to be independently related to 6-month mortality were exclusively medical factors: malnutrition or risk thereof (HR = 1.92; 95% CI = 1.17–3.16), delirium (HR = 1.80; 95% CI = 1.24–2.62), and a high level of comorbidity (HR = 1.62; 95% CI = 1.09–2.40). Institutionalization (HR = 1.92; 95% CI = 1.37–2.71) and unplanned readmission (HR = 4.47; 95% CI = 3.16–2.71) within the follow-up period were also found as independent predictors.

Conclusion. – The main factors predictive of 6-month outcome identified in this study are modifiable by global and multidisciplinary interventions. Their early identification and management would make it possible to modify frail elderly subjects' prognosis favorably.

Keywords: Elderly; Institutionalization; Mortality; Prediction; Comprehensive geriatric assessment; SAFES cohort

* Corresponding author.
E-mail address: mdrame@chu-reims.fr (M. Dramé).

0398-7620
http://dx.doi.org/10.1016/j.respe.2011.11.004

Résumé

Position du problème. – L'objectif de ce travail était d'identifier les facteurs prédictifs d'institutionnalisation et de décès au cours des six mois ayant suivi l'admission en urgence.

Méthodes. – L'étude a été réalisée à partir d'une cohorte française (SAFES) composée de sujets âgés de 75 ans ou plus admis dans un service de court séjour de médecine. Étaient recueillies des données sociodémographiques et d'évaluation gériatrique standardisée. Les événements analysés par une régression de Cox étaient l'institutionnalisation et la mortalité dans les six mois ayant suivi l'admission aux urgences.

Résultats. – Les taux bruts d'institutionnalisation et de décès étaient de 18 % et 24 %, respectivement. Les marqueurs indépendants de risque d'entrée en institution étaient : le fait de vivre seul (HR = 1,83 ; IC 95 % = 1,27–2,62), un nombre d'enfants plus élevé (HR = 0,86 ; IC 95 % = 0,78–0,96), les troubles de l'équilibre (HR = 1,72 ; IC 95 % = 1,19–2,47), le risque de malnutrition (HR = 1,93 ; IC 95 % = 1,24–3,01) et l'existence d'un syndrome démentiel (HR = 1,88 ; IC 95 % = 1,32–2,67). Les facteurs qui étaient significativement liés à la mortalité au cours des six mois concernaient : un risque de malnutrition (HR = 1,92 ; IC 95 % = 1,17–3,16), un syndrome confusionnel (HR = 1,80 ; IC 95 % = 1,24–2,62) et un niveau élevé de comorbidité (HR = 1,62 ; IC 95 % = 1,09–2,40). L'institutionnalisation (HR = 1,92 ; IC 95 % = 1,37–2,71) et la réhospitalisation (HR = 4,47 ; IC 95 % = 3,16–6,33) au cours du suivi étaient aussi des facteurs indépendants de mortalité.

Conclusion. – La plupart des facteurs prédictifs du devenir à six mois identifiés sont modifiables par une approche globale et multidisciplinaire (médicale et non médicale). Leur identification précoce et leur prise en charge permettrait de modifier favorablement le pronostic des personnes âgées fragiles.

Mots clés : Sujet âgé ; Institutionnalisation ; Mortalité ; Prédiction ; Évaluation gériatrique standardisée ; Cohorte SAFES

1. Introduction

The elderly use emergency care facilities (ECF) more often than young subjects [1,2]. In the elderly, the ECF is the most frequent admission modality to the hospital [3]. The originating pathology of an elderly individual's emergency hospitalization will often decompensate an underlying frail state, making the prognosis more random. A multidimensional assessment can help in the early detection of potential risk markers and screen the most vulnerable patients [4], notably in terms of loss of autonomy, early rehospitalization, increased length of hospital stay, institutionalization, and even death. Better knowledge of these markers helps define care objectives, improves the identification of care procedures, and influences therapy decision-making [5]. The SAFES (Sujet Âgé Fragile – Évaluation Suivi; Frail Elderly Subject – Assessment Follow-up) cohort chose to identify emergency hospitalization as a stress factor that could be the source of decompensation of a frail state in subjects aged 75 years and older. Although many studies have examined factors of poor prognosis in the elderly, only a limited number have studied the "frail" population [6–10], and in most of these studies, the authors only studied one event at a time.

The objective of this study was to identify the markers of institutionalization or mortality with 6 months of follow-up in subjects aged 75 years or older hospitalized in an emergency setting in a short-stay medical facility.

2. Methods

The SAFES cohort was a prospectively formed cohort based on the ECFs in nine French hospital centers. Each of these nine centers had a short-stay geriatric department.

2.1. Study population

To be eligible for the study, the subjects had to be 75 years or older and admitted to an ECF. They had to be hospitalized in one of the short-stay medical departments of the same hospital center. Admission to an ECF or surgery department or not being hospitalized was criteria for non-inclusion. Eligible subjects were randomly selected based on the list of ECF admissions at a rate of ten subjects per week. Each subject was then visited between the 4th and 7th day of hospitalization for his or her final inclusion and initial evaluation. This study followed the precepts of the Declaration of Helsinki and French laws concerning biomedical research. It satisfied all ethical requirements in force at the time of the study.

2.2. Main variables

All the subjects included in the cohort were assessed by a geriatrician, assisted by a member of the care staff in the department where the subject was hospitalized or by the subject's main caregiver. This assessment collected a large number of sociodemographic and clinical data. The socio-demographic variables concerning age, sex, residence, level of education, number of children, and the presence or absence of the patient's main caregiver. The clinical data collected followed the Comprehensive Geriatric Assessment (CGA). The level of dependence in basic activities of daily living (ADL) was evaluated using the Katz scale [11]. The subject was considered to be dependent if, within the previous 2 weeks, he or she had lost the ability to carry out at least one of the six following activities: washing the face, dressing, using the toilet, locomotion, feeding, and continence. Walking and balance were evaluated by the Get-up-and-Go test [12] and the one-leg balance test [13]. A Get-up-and-Go test lasting longer than 20 s defined problems walking. A one-leg balance test under 5 s on at least one of the two legs defined balance problems. Mood disorders and risk of depression were assessed using Gilleard's depression scale [14]. A score higher than 14 indicated a risk for depression. Dementia and delirium were defined by the presence of a diagnosis made by a senior geriatrician according

to the DSM-IV criteria [15]. The patient's nutritional status was assessed using the Mini Nutritional Assessment-Short Form (MNA-SF) [16]. A score less than 12 defined the existence of a risk for malnutrition. The risk for the onset of bedsores was evaluated using the Norton scale: a score less than or equal to 14 demonstrated a risk for the onset of bedsores [17]. A version of the Charlson Index adapted to the IDC-10 [18] was used (a score more than or equal to 3 was considered a high level of comorbidity). A history of hospitalization in the last 3 months and the day of admission to the EFC (weekday or weekend) were also noted. Unplanned readmission and institutionalization were used as explanatory variables in the mortality analysis. For the analysis of institutionalization, only unplanned readmission was introduced as an explanatory variable. It was right censored when it occurred after institutionalization.

2.3. Statistical analysis

The events studied were institutionalization or death of the patient during the 6 months following his or her admission to the ECF. The institution was defined as an institution for the dependent elderly (nursing home) or a long-term care facility. Patients were censored if they left the study (refusal of follow-up or lost to follow-up) or if the events occurred after the follow-up period. The beginning of follow-up corresponded to the date of arrival in the ECF. In descriptive analysis, the quantitative variables are presented as numbers and percentages: the quantitative variables are described using their means and standard deviations. Bivariable analysis was used to select candidate variables for multifactor analysis. The threshold probability for entering variables into the multivariable model was $P < 0.20$. In multivariable analysis, the Cox model was used to identify the independent markers of risk of occurrence of the two events studied. The investigation center was proposed as a systematic adjustment variable. The significance level of the statistical tests performed with SAS V9.1 software (SAS Institute, Inc., Cary, NC, USA) was set at 0.05.

3. Results

Fig. 1 summarizes the selection process and the outcome of the cohort's 1306 patients whose characteristics are described in Table 1. Their age varied between 75 and 103 years for a mean of 85 ± 6 years. The median number of children per person was 2, ranging from 0 to 15. Of the 1306 patients comprising the cohort, 1047 were considered for the analysis of institutionalization because 259 already lived in an institutional

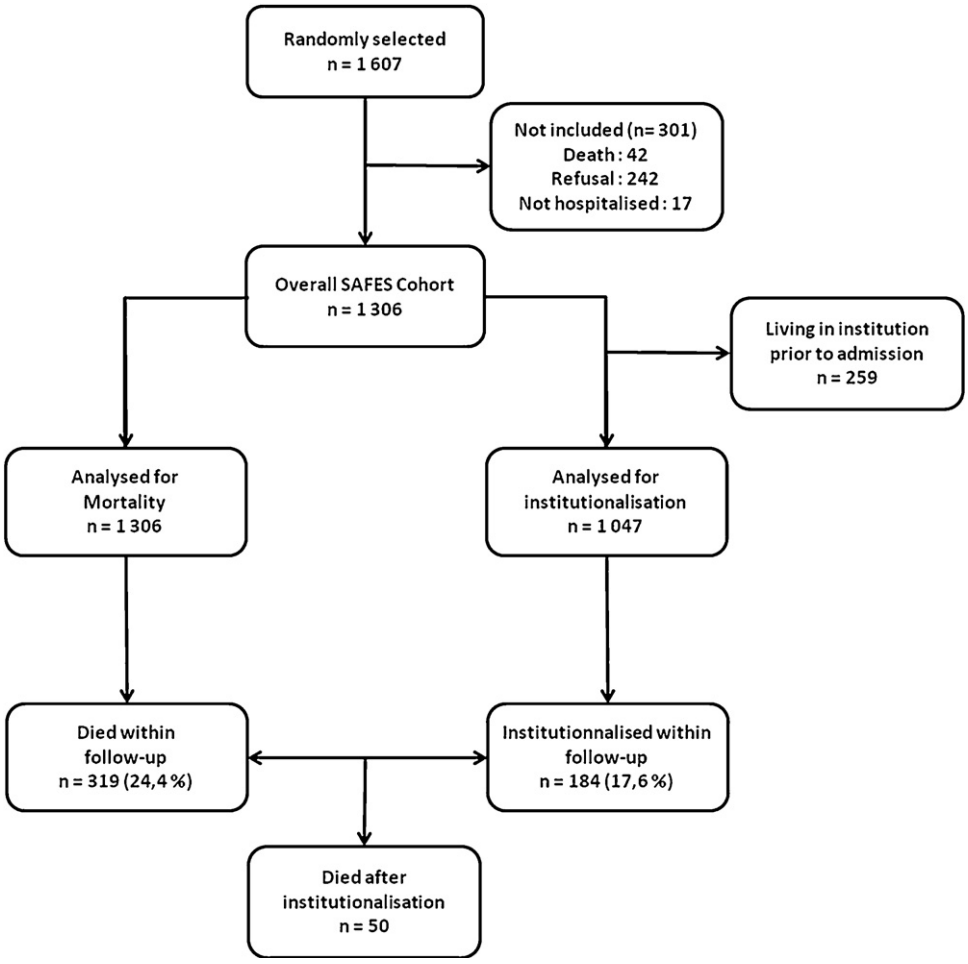

Fig. 1. Flow chart describing the selection and outcome of patients included in the study.

Table 1
Sociodemographic and medical characteristics of the total population at inclusion ($n = 1306$).

Characteristics	*N*	%
Age ≥ 85 years	641	49.1
Sex: male	461	35.3
Residence: institution	259	19.8
Living alone: yes	526	40.9
Number of children < 2	579	45.6
Main caregiver: yes	855	65.5
Educational level: primary school	873	71.0
Dependence in ADL: yes	765	60.1
Problems walking: yes	1059	81.1
Balance problems: yes	661	51.2
Risk of depression: yes	568	43.5
Dementia syndrome: yes	589	45.4
Delirium: yes	261	20.1
Risk of malnutrition: yes	949	73.5
Risk of bedsores: yes	524	40.2
Charlson comorbidity score ≥ 3	307	16.6
Recent hospitalization: yes	359	28.0
Day of admission: weekend	307	23.5

Missing data: residence: 20; number of children: 47; educational level: 76; living alone: 20; dependence in ADL: 34; problems walking: 1; balance problems: 15; dementia and delirium: 10; risk of malnutrition: 14; risk of bedsores: 3; recent hospitalization: 25.

setting at the time of their inclusion. All 1306 subjects were considered for the analyses studying mortality.

After 6 months of follow-up, 184 (17.6%) had been institutionalized and 319 subjects (24.4%) had died. Of these 319 deaths, 50 (15.7%) occurred in the institution. Fig. 2A and B reports the distribution function of crude survival and institutionalization after 6 months of follow-up in the SAFES cohort.

The results of the multivariable analyses are presented in Table 2. The independent risk markers for institutionalization during the 6 months, covering both social factors (living alone or the number of children) and medical factors (balance problems, the risk of malnutrition, and the existence of a dementia syndrome). A higher number of children were a protective factor against institutionalization, whereas all the other markers increased risk.

The factors that were significantly related to mortality over the 6 months involved medical variables (the existence of a risk of malnutrition, the presence of delirium, and the presence of comorbidities) as well as in-hospital pathway variables (institutionalization or unplanned rehospitalization occurring before death). The presence of each of these markers increased the risk of death within 6 months.

No center effect was observed for either institutionalization or mortality.

4. Discussion

This study allowed us to identify the independent risk markers of the two events studied, i.e., institutionalization and mortality in the 6 months following admission to the ECF. The risk markers for institutionalization stem from a low number of social contacts as well as clinical characteristics (balance problems, cognitive impairment, and nutritional disorders). For mortality, in addition to cognitive disorders, nutritional problems, and comorbidities, we found the effect of in-hospital pathways (unplanned rehospitalization and institutionalization).

In this population, institutionalization was most often endured rather than desired [19]. In addition, the challenges of aging populations in industrialized countries will increasingly result in an insufficient number of places available in

Table 2
Multivariable analyses of risk of institutionalization and mortality at 6 months.

	Risk of institutionalization $n = 1047$			Risk of morality $n = 1306$		
Variable	RR	95% CI	*P*	RR	95% CI	*P*
Age ≥ 8 years[b]						
Sex: male[a]						
Living alone: yes[a]	1.83	1.27–2.62	0.001			
Number of children (+1 child)[a,b]	0.86	0.78–0.96	0.005			
Educational level: secondary[b]						
Educational level: university[b]						
Problems walking: yes[a,b]						
Balance problems: yes[a,b]	1.72	1.19–2.47	0.004			
Risk of depression: yes[a]						
Dementia syndrome: yes[a,b]	1.88	1.32–2.67	< 0.001			
Delirium: yes[b]				1.80	1.24–2.62	0.002
Risk of malnutrition: yes[a,b]	1.93	1.24–3.01	0.004	1.92	1.17–3.16	0.01
Risk of bedsores: yes[a]						
Charlson comorbidity score ≥ 3[a,b]				1.62	1.09–2.40	0.02
Institutionalization: yes[b]				1.92	1.37–2.71	< 0.001
Rehospitalization: yes[a,b]				4.47	3.16–6.33	< 0.001
Recent hospitalization: yes[b]						
Day of admission: weekend[a]						

RR: adjusted relative risk; 95% CI: 95% confidence interval.
[a] Variables included in the multivariable analysis for institutionalization.
[b] Variables included in the multivariable analysis for mortality

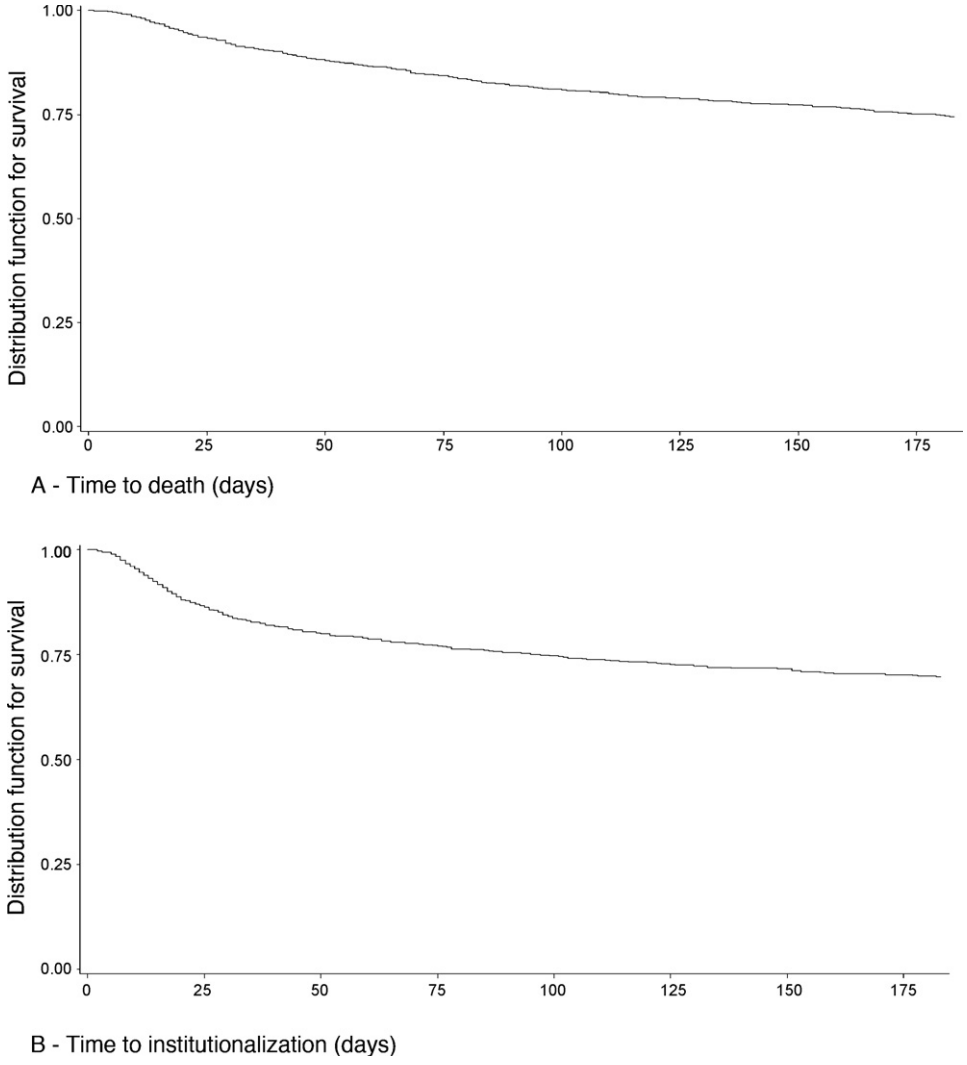

Fig. 2. Distribution functions of survival (A) and institutionalization (B) for 6 months follow-up in the SAFES cohort.

institutions for the number of persons who will need placement. There is consequently a clear need to control the factors that are potentially modifiable so as to limit recourse to this solution as much as possible.

ADL dependence was not raised as an explanatory variable of mortality because it was highly correlated with most of the cofactors studied. Its presence prevented certain variables of interest from remaining in the final model. In common clinical practice, the fight against loss of autonomy is devised within overall multidisciplinary interventions. As shown by Colvez et al. [20], it seems to be the consequence of the disturbance of other essential functions (cognitive function, the state of comorbidity, nutritional status, etc.) that should be identified and managed efficiently. In any event, its harmful role on mortality [5,9] and institutionalization [21,22] is well-known.

In this study, the existence of a risk of malnutrition was significantly related to mortality and institutionalization. Several authors have also demonstrated this relation for mortality [9,23]. For institutionalization, Luk et al. [24] demonstrated a protective effect of a normal serum albumin level at the end of hospitalization on the risk of institutionalization. A few authors recommend setting up early nutritional supplementation to avoid harmful complications [25]. Others recommend educating caregivers to prevent, screen for, and correct nutritional problems [26].

Alteration of cognitive functions has also appeared as an independent factor of mortality. Several studies have found similar results [9,27,28]. This effect of cognitive disorders on mortality persists over both the short-term [29] and the long-term [9,28,30]. Several authors [31,32] have demonstrated the harmful role played by delirium on outcome (mortality and institutionalization) of the hospitalized elderly. Delirium can threaten the short-term vital prognosis because it is likely related to an acute underlying problem [33,34], whereas dementia could affect the elderly's autonomy and the exhaustion of their long-term caregiver, thus increasing the risk of institutionalization [35,36]. According to Potter et al. [34], nearly one-third of delirium cases could be prevented by treating the acute confusional state, by removing factors that can induce or even worsen it, and by screening vulnerable subjects.

As in other studies [9,37], we found that moderate or severe comorbidity was an independent risk factor for death. This result was also found by Ponzetto et al. [37]. Similarly, Buntix

et al. [38] also demonstrated a significant relationship between comorbidity and survival. In a more recent meta-analysis, Gaugler et al. [36] demonstrated the predictive role of cancer, diabetes, and stroke on institutionalization. On the other hand, neither cardiovascular diseases nor osteoarticular disorders were significantly related to institutionalization.

Balance problems, indicating a risk of falling, were significantly related to the risk of institutionalization. Several studies found the same result [24,39]. The risk of falling confers a feeling of insecurity at home, which often encourages the family to request the elderly individual be placed in an institution, particularly if he or she lives alone [40]. However, living alone did not affect mortality, which seemed more closely related to medical rather than social parameters.

In Western countries, an informal network for the most part made up of family members, is an essential resource allowing the elderly to remain at home as long as possible [41,42]. Since the care needed can be consequential and for a long duration, the smaller the informal network is, the more rapidly informal caregivers will be exhausted, requiring turning to formal systems of care [43,44]. In the present study, a high number of children were inversely related to institutionalization. These results were confirmed by several authors [45–47].

In the analysis of mortality, institutionalization and unplanned readmission to the hospital were independent markers of this event. On the other hand, unplanned readmission was not identified as an independent marker of institutionalization. To our knowledge, the effect of these two factors on the outcome of the elderly has not been studied. Yet, as underscored by our study, their outcome can have a negative impact on mortality independently of the other characteristics.

Multidimensional assessment of the health status of the elderly patient can identify the predictive factors of a negative outcome. These factors allow one to identify the most vulnerable patients upon admission so as to plan for optimal multidisciplinary care.

Today, the ECF is commonly used in geriatric practice because it is an effective tool providing a new approach to the elderly 75 years of age or older. Already in 1984, Rubenstein et al. [48] had shown that elderly hospitalized patients who had made use of an ECF had a significantly more favorable outcome than those who had been through a ''classic'' care system. They thus showed that an overall assessment of the elderly individual reduced morbidity and mortality and limited healthcare expenses [48]. Later, Stuck et al. [49] confirmed these results in a meta-analysis. According to them, using an ECF during hospitalization reduces mortality (−14%), decreases the frequency of rehospitalization (−12%), increases the survival of patients living at home (+26%), and improves cognitive functions (+41%) and the patient's functional status (+72%).

From a methodological perspective, the quality of the results is reinforced by its being a multicenter study, the number of subjects and important events, giving the study good statistical power. In addition, the variables were collected by researchers, physicians specialized in geriatrics. Certain limits can, however, be underscored:

- the patients admitted to a surgery or intensive care department were not included. Consequently, the patients in this study are not representative of the French population of patients 75 years and older admitted to an ECF. The advantage of recruiting in the emergency department was the ability to select a maximum of ''frail'' subjects because the ECF is the entry to the hospital most frequently used by the elderly. Moreover, the objective of the SAFES study was to establish and follow a cohort of subjects who were at high risk of decompensation of an underlying frail state so as to study the outcome of the intrahospital trajectories followed. The ECF was the preferred place of recruitment;
- our model did not have external validation. Our results remain, however, in compliance with our hypotheses and are highly coherent with the data reported in the literature;
- a differential bias could have been induced by the number of patients who refused the follow-up, but these subjects did not differ from the others in terms of mean age, sex ratio, and level of dependence. Moreover, the analysis of the censored data that we used allowed us to take into account the entire duration of follow-up before the refusal in the analyses.

All in all, the task was to model the risk of death and institutionalization with the variables from the CGA. Using simple and commonly used scales in geriatric practice, it is possible to identify early the modifiable long-term risk factors of death such as malnutrition, confusion, and physical dependence. This would warrant reinforcing the presence of dieticians, neuropsychologists, and physical therapists in the geriatric care units because if these problems are not corrected early, they could have serious repercussions, even beyond the acute phase.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgements to research funders

- The Ministry of Health for funding national hospital clinical research programs (PHRC 1998), France;
- The National Health Insurance Agency for Wage Earners (CNAMTS, France);
- The Institute of Longevity and Ageing (Inserm, France).

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.respe.2011.11.004.

References

[1] Singal BM, Hedges JR, Rousseau EW, Sanders AB, Berstein E, McNamara RM, et al. Geriatric patient emergency visits. Part I: comparison of

visits by geriatric and younger patients. Ann Emerg Med 1992;21(7): 802–7.
[2] Vanpee D, Swine C, Vandenbossche P, Gillet JB. Epidemiological profile of geriatric patients admitted to the emergency department of a university hospital localized in a rural area. Eur J Emerg Med 2001;8(4):301–4.
[3] Denman SJ, Ettinger WH, Zarkin BA, Coon PJ, Casani JA. Short-term outcomes of elderly patients discharged from an emergency department. J Am Geriatr Soc 1989;37(10):937–43.
[4] McCusker J, Bellavance F, Cardin S, Trepanier S. Screening for geriatric problems in the emergency department: reliability and validity. Identification of Seniors at Risk (ISAR) Steering Committee. Acad Emerg Med 1998;5(9):883–93.
[5] Zuliani G, Romagnoni F, Soattin L, Leoci V, Volpato S, Fellin R. Predictors of two-year mortality in older nursing home residents. The IRA study. Istituto di Riposo per Anziani. Aging (Milan Italy) 2001;13(1):3–7.
[6] Covinsky KE, Eng C, Lui LY, Sands LP, Yaffe K. The last 2 years of life: functional trajectories of frail older people. J Am Geriatr Soc 2003;51(4):492–8.
[7] Landi F, Cesari M, Onder G, Zamboni V, Barillaro C, Lattanzio F, et al. Indwelling urethral catheter and mortality in frail elderly women living in community. Neurourol Urodyn 2004;23(7):697–701.
[8] Saltvedt I, Mo ES, Fayers P, Kaasa S, Sletvold O. Reduced mortality in treating acutely sick, frail older patients in a geriatric evaluation and management unit. A prospective randomized trial. J Am Geriatr Soc 2002;50(5):792–8.
[9] Temkin-Greener H, Bajorska A, Peterson DR, Kunitz SJ, Gross D, Williams TF, et al. Social support and risk-adjusted mortality in a frail older population. Med Care 2004;42(8):779–88.
[10] Winograd CH, Gerety MB, Chung M, Goldstein MK, Dominguez FJJr, Vallone R. Screening for frailty: criteria and predictors of outcomes. J Am Geriatr Soc 1991;39(8):778–84.
[11] Katz S, Akpom CA. A measure of primary sociobiological functions. Int J Health Serv 1976;6(3):493–508.
[12] Mathias S, Nayak US, Isaacs B. Balance in elderly patients: the get-up and go test. Arch Phys Med Rehabil 1986;67(6):387–9.
[13] Vellas BJ, Wayne SJ, Romero L, Baumgartner RN, Rubenstein LZ, Garry PJ. One-leg balance is an important predictor of injurious falls in older persons. J Am Geriatr Soc 1997;45(6):735–8.
[14] Gilleard CJ, Willmott M, Vaddadi KS. Self-report measures of mood and morale in elderly depressives. Br J Psychiatry 1981;138:230–5.
[15] American Psychiatry Association, ed. DSM-IV, diagnosis and statistical manual of mental disorders, 4th ed, Washington: American Psychiatry Association; 1994.
[16] Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini nutritional assessment (MNA-SF). J Gerontol A Biol Sci Med Sci 2001;56(6):M366–72.
[17] Norton D, McLaren R, Exton-Smith A. An investigation of nursing problems in hospitals. New York: Churchill Livingstone; 1975.
[18] Sundararajan V, Henderson T, Perry C, Muggivan A, Quan H, Ghali WA. New ICD-10 version of the Charlson comorbidity index predicted in-hospital mortality. J Clin Epidemiol 2004;57(12):1288–94.
[19] Somme D, Thomas H, de Stampa M, Lahjibi-Paulet H, Saint-Jean O. Residents' involvement in the admission process in long-term care settings in France: results of the EHPA 2000 survey. Arch Gerontol Geriatr 2008;47(2):163–72.
[20] Colvez A, Robine JM, Jouan-Flahault C. Risk and risk factors of disability in the aged [Risque et facteurs de risque d'incapacité aux âges élevés]. Rev Epidemiol Sante Publique 1987;35(3–4):257–62.
[21] Astell AJ, Clark SA, Hartley NT. Predictors of discharge destination for 234 patients admitted to a combined geriatric medicine/old age psychiatry unit. Int J Geriatr Psychiatry 2008;23(9):903–8.
[22] Gaugler JE, Pot AM, Zarit SH. Long-term adaptation to institutionalization in dementia caregivers. Gerontologist 2007;47(6):730–40.
[23] Van Nes MC, Herrmann FR, Gold G, Michel JP, Rizzoli R. Does the mini nutritional assessment predict hospitalization outcomes in older people? Age Ageing 2001;30(3):221–6.
[24] Luk JK, Chiu PK, Chu LW. Factors affecting institutionalization in older Hong Kong Chinese patients after recovery from acute medical illnesses. Arch Gerontol Geriatr 2009;49(2):e110–4.
[25] Marengoni A, Cossi S, De Martinis M, Ghisla MK, Calabrese PA, Zanolini G, et al. Adverse outcomes in older hospitalized patients: the role of multidimensional geriatric assessment. Aging Clin Exp Res 2003;15(1):32–7.
[26] Donini LM, De Felice MR, Cannella C. Nutritional status determinants and cognition in the elderly. Arch Gerontol Geriatr 2007;44(Suppl. 1):143–53.
[27] Fried TR, Pollack DM, Tinetti ME. Factors associated with six-month mortality in recipients of community-based long-term care. J Am Geriatr Soc 1998;46(2):193–7.
[28] Ho SC. Health and social predictors of mortality in an elderly Chinese cohort. Am J Epidemiol 1991;133(9):907–21.
[29] Narain P, Rubenstein LZ, Wieland GD, Rosbrook B, Strome LS, Pietruszka F, et al. Predictors of immediate and 6-month outcomes in hospitalized elderly patients. The importance of functional status. J Am Geriatr Soc 1988;36(9):775–83.
[30] Incalzi AR, Capparella O, Gemma A, Porcedda P, Raccis G, Sommella L, et al. A simple method of recognizing geriatric patients at risk for death and disability. J Am Geriatr Soc 1992;40(1):34–8.
[31] Bourdel-Marchasson I, Vincent S, Germain C, Salles N, Jenn J, Rasoamanarivo E, et al. Delirium symptoms and low dietary intake in older inpatients are independent predictors of institutionalization: a 1-year prospective population-based study. J Gerontol A Biol Sci Med Sci 2004;59(4):350–4.
[32] Marcantonio ER, Kiely DK, Simon SE, John Orav E, Jones RN, Murphy KM, et al. Outcomes of older people admitted to postacute facilities with delirium. J Am Geriatr Soc 2005;53(6):963–9.
[33] Nassisi D, Korc B, Hahn S, Bruns JJJr, Jagoda A. The evaluation and management of the acutely agitated elderly patient. Mt Sinai J Med 2006;73(7):976–84.
[34] Potter J, George J, Group GD. The prevention, diagnosis and management of delirium in older people: concise guidelines. Clin Med 2006;6(3):303–8.
[35] Aditya BS, Sharma JC, Allen SC, Vassallo M. Predictors of a nursing home placement from a non-acute geriatric hospital. Clin Rehabil 2003;17(1):108–13.
[36] Gaugler JE, Duval S, Anderson KA, Kane RL. Predicting nursing home admission in the U.S: a meta-analysis. BMC Geriatr 2007;7:13.
[37] Ponzetto M, Maero B, Maina P, Rosato R, Ciccone G, Merletti F, et al. Risk factors for early and late mortality in hospitalized older patients: the continuing importance of functional status. J Gerontol A Biol Sci Med Sci 2003;58(11):1049–54.
[38] Buntinx F, Niclaes L, Suetens C, Jans B, Mertens R, Van den Akker M. Evaluation of Charlson's comorbidity index in elderly living in nursing homes. J Clin Epidemiol 2002;55(11):1144–7.
[39] Tinetti ME, Williams CS. Falls, injuries due to falls, and the risk of admission to a nursing home. N Engl J Med 1997;337(18):1279–84.
[40] Mantovani J, Rolland C, Andrieu S. Étude sociologique sur les conditions d'entrée en institution des personnes âgées et les limites du maintien à domicile. Direction de la recherche, des études, de l'évaluation et des statistiques 2008.
[41] Brodaty H, Luscombe G. Psychological morbidity in caregivers is associated with depression in patients with dementia. Alzheimer Dis Assoc Disord 1998;12(2):62–70.
[42] Murray J, Schneider J, Banerjee S, Mann A. EUROCARE: a cross-national study of co-resident spouse carers for people with Alzheimer's disease: II-A qualitative analysis of the experience of caregiving. Int J Geriatr Psychiatry 1999;14(8):662–7.
[43] Antonucci TC, Lansford JE, Schaberg L, Baltes M, Takahashi K, Dartigues JF, et al. Widowhood and illness: a comparison of social network characteristics in France, Germany, Japan, and the United States. Psychol Aging 2001;16(4):655–65.
[44] Zarit SH, Gaugler JE, Jarrott SE. Useful services for families: research findings and directions. Int J Geriatr Psychiatry 1999;14(3):165–77 [discussion 78–81].

[45] Poulain M. Institutionalisation in Belgium 1991–2002. Gerontol Soc 2005;(112):25–48.
[46] Hirono N, Tsukamoto N, Inoue M, Moriwaki Y, Mori E. Predictors of long-term institutionalization in patients with Alzheimer's disease: role of caregiver burden. No To Shinkei 2002;54(9):812–8.
[47] Soto ME, Andrieu S, Gillette-Guyonnet S, Cantet C, Nourhashemi F, Vellas B. Risk factors for functional decline and institutionalisation among community-dwelling older adults with mild to severe Alzheimer's disease: one year of follow-up. Age Ageing 2006;35(3):308–10.
[48] Rubenstein LZ, Josephson KR, Wieland GD, English PA, Sayre JA, Kane RL. Effectiveness of a geriatric evaluation unit. A randomized clinical trial. N Engl J Med 1984;311(26):1664–70.
[49] Stuck AE, Siu AL, Wieland GD, Adams J, Rubenstein LZ. Comprehensive geriatric assessment: a meta-analysis of controlled trials. Lancet 1993;342(8878):1032–6.